



WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: The Efficacy of Employing *Bacillus globii* as a Particulate Tracer in Various Aquatic Systems.

Focus Category: Groundwater quantity & quality, Surface water quantity and quality

Keywords: Tracer, particulate, microorganism, transport, hydraulics.

Duration: 3/1/99 to 02/29/00.

Fiscal Year 1999 Federal Funds:

- Total: \$25,013
- Direct: \$25,013
- Indirect: \$0

Non Federal Funds: \$

- Total: 50,784
- Direct:\$29,084
- Indirect: \$21,700

Name, University, and City of principal investigator: Dr. Clifford R. Lange, Auburn University, Auburn, Alabama.

Congressional District:

Identification and Statement of the Major Regional Water Problem

The ability to understand, protect, and modify aqueous systems depends on the ability to quantify the hydraulic transport of dissolved and particulate compounds. Assessing the transport of dissolved compounds using conventional miscible tracers has been well studied. However, the quest for suitable particulate tracers continues. Particulate tracers are important for determining the transport of sediments and microorganisms in both surface and ground water systems.

A new particulate tracer would be of great use in the study of contaminant transport and mitigation in surface waters and in groundwater. This tracer could be employed as a tool to identify sources of environmental contamination (i.e., sewer leaks or faulty septic systems) and to study the fate of contamination in the environment. Additionally, particulate tracers can be employed in the design and construction of engineered systems, such as water and wastewater treatment plants.

Statement of Results, Benefits, and/or Information

The goal of the proposed research is to determine the efficacy of *Bacillus globii* as a particulate tracer. By the conclusion of the one-year study period, the usefulness of this bacteria as an environmental particulate tracer should be determined. The behavior of *Bacillus globii* will be compared to currently employed particulate tracers (i.e., fluorescent beads) and common environmental microorganisms. Various flow regimes will be used to facilitate this study, including: complete mixed, plug-flow, and porous media. For each flow regime, clean water and water containing background particulates will be tested.

For each reactor system, a total of 10 replicate tests will be conducted using a miscible tracer and the particulate tracer. The mean particle residence time and the coefficient of dispersion will be determined for each test. A statistical comparison between the tracers and common microorganisms will be conducted to determine if the *B. globii* adequately represents the transport of particulates under the particular flow regime. To verify the results of laboratory testing, field tests in a shallow groundwater aquifer, a well mixed lagoon system, and a stream will be conducted and compared to the laboratory results.